SHORT COMMUNICATION

Carbon and nitrogen nutritional dynamics of *Microsporum gypseum* Bodin

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Keratinophillic fungi are the group of fungi capable of degrading the hard protein keratin and utilize the same for their growth. However, the growth of these fungi is also found to be influenced by various other factors like chemical composition and quantity of soil organic matter. In the present study an attempt has been made to study the carbon and nitrogen assimilation pattern of keratinophilic fungus *Microsporum gypseum*. This has been done by substituting glucose of Sabouraud's glucose liquid medium by different carbon sources and peptone of Sabouraud's glucose liquid medium by different nitrogen sources. The study has revealed that of all the carbon and nitrogen sources employed, glucose and peptone served as the best carbon and nitrogen source respectively to the present isolate of *Microsporum gypseum.*

Key words: Carbon source, Keratinophilic fungus, *Microsporum gypseum*, Nitrogen source, Sabouraud's glucose medium

INTRODUCTION

Keratinophilic fungi are a group of highly specialized fungi which possess the ability to degrade hard keratin and utilize it as a source of protein. In addition to the availability of keratinous substrates, the fungi in the soils may be influenced by various factors such as chemical composition and quantity of soil organic matter. Nutritional requirement of the keratinophilic fungi for carbon, nitrogen, vitamin and trace elements varies considerably. The requirements have been discussed by Stockdale (1953) , Kunert (2000), Misra *et al,* (2015). Of the carbon sources, dermatophytes have a common preference for carbohydrates and exhibits best growth in the presence of glucose. The dermatophytes are able to grow on some of the more complex carbohydrates such as starch. Grains of cereals are used for isolating fungi from skin lesions and use of polished rice grains is also recommended for production of spores by *Microsporum* (Stockdale, 1953). The dermatophytes, except some pleomorphic forms, show very poor to nil response to inorganic nitrogen. In the present study an attempt has been made to study the effect of different carbon and nitrogen sources on the growth of one of the widely occurring keratinophilic fungus *Microsporum gypseum.*

MATERIALS AND METHODS

Effect of different Carbon sources

In the present investigation, glucose of the Sabouraud's glucose liquid medium has been sub-

stituted by different carbon sources to study the carbon assimilation pattern of the keratinophilic fungus. 14 different carbon sources have been employed in the present study – Glucose, Galactose, Sucrose, Lactose, Maltose, Starch, Dextrin, Mannitol, Sorbitol, Glycerol, Lactic acid, Citric acid, Succinic acid and Salicylic acid. Three replicates were maintained. The cultures were filtered at different intervals (5, 10 and 15 days) through previously weighed Whatman No.1 filter paper. The filter papers were dried at 70^0C in an electric oven for 3 days and dry weights were obtained. Control was maintained without carbon source.

Effect of different Nitrogen sources

In order to study the nitrogen assimilation pattern of the keratinophilic fungus *Microsporum gypseum*, Peptone of the Sabouraud's glucose has been substituted by different nitrogen sources, 14 different nitrogen sources have been employed. They are – Peptone, Potassium nitrate, Silver nitrate, Ammonium oxalate, Sodium nitrite, DL-Phenyl alanine, L-Glycine, L-Argine, L-Glutamic acid, DL-Aspartic acid and L-Asparagine. Three replicates were maintained. The cultures were filtered at different intervals (5, 10 and 15 days) through previously weighed Whatman No.1 filter paper. The filter papers were dried at 700C in an electric oven for 3 days and dry weights were obtained. Control was maintained without Nitrogen source.

RESULTS AND DISCUSSION

Observation of the effect of different Carbon sources on the growth of Microsporum gypseum

It has been observed that of all the carbon sources employed in the present study, maximum growth of the fungus was recorded in medium containing Glucose followed by Lactose, Glycerol, Galactose and Maltose. Growth of the fungus was also detected in control (without carbon source). The result is graphically illustrated (Fig.1) and are given in the Table 1. No fungal growth was recorded in other Carbon sources. The data was statistically analysed and is expressed in terms of Standard error [Mean±S.E(n=3)]. The effect of different carbon sources on the growth of the fungus with respect to control was compared by performing T-test.

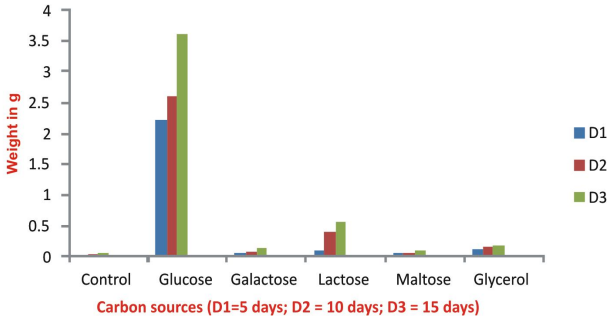

Fig. 1 : Effect of different carbon sources on the growth of *Microsporum gypseum*

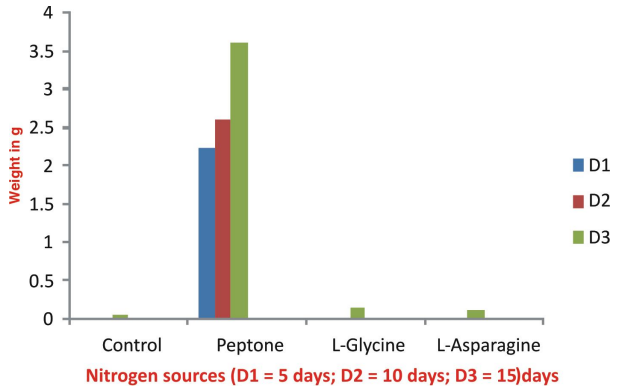

Fig. 2 : Effect of different Nitrogen sources on the growth of *Microsporum gypseum*

Observation of the effect of different Nitrogen sources on the growth of Microsporum gypseum

It is evident from the Table 2 that of all the nitrogen sources used peptone containing Sabouraud's liquid medium supported maximum growth. Limited growth of the fungus was observed only in L-Glycine, followed by Asparagine. A small amount of growth was also observed in control (without nitrogen source). The result is graphically illustrated (Fig.2). The dry weights of the mycelium obtained are present in the Table 2. The result of the study obtained was subjected to statistical analysis and is expressed in terms of standard error [Mean±S.E(n=3)]. T-test has been performed to compare the effect of different nitrogen sources on the growth of the fungus with respect to control. Soil as a habitat supplies carbon, nitrogen and other elements as it contain organic matter, nitrates, phosphates, organic and inorganic minerals and other salts. Therefore, the impact of carbon and nitrogen on the growth of *Microsporum gypseum* has been taken up. Such requirements have been studied earlier by Stockdale (1953) on some keratinophilic fungi. Kushwaha (1983) has

Table 1 : Effect of different carbon sources on the growth (in g) # of *Microsporum gypseum*

Carbon sources	Days of Incubation				
	D1	D2	t-value	D3	t-value
Control		0.0348±0.0042		0.0540±0.0060	
Glucose	2.23±0.140	2.60±0.05	51.3***	3.6±0.11	27.8***
Galactose	0.0600±0.01	0.08±0.0057	6.45***	0.14±0.0088	8.6***
Lactose	0.1078±0.0057	0.3942±0.01	35.94***	0.5480±0.01	44.9***
Maltose	0.0457±0.0068	0.0536±0.0030	3.76**	0.1010±0.0040	6.52***
Glycerol	0.1250±0.0060	0.1648±0.0064	17***	0.1945±0.0040	19.5***

D1=5 days; D2=10 days; D3=15 days;
#Values are means S.E
*, **, *** significant at Pd"0.05, 0.025, 0.010 respectively

Table 2 : Effect of different Nitrogen sources on the growth (in g) # of *Microsporum gypseum*

Nitrogen sources	Days of Incubation			
	D 1	D2	D3	t - value
Control			0.0375±0.00 7	
Peptone	2.23±0.140	2.60±0.05	3.6±0.11	10.78***
L - Glycine			0.1507±0.0057	14.15***
L - Asparagine			0.1067±0.0011	12.14***

D1=5 days; D2=10 days; D3=15 days;
#Values are means S.E
*, **, *** significant at Pd"0.05, 0.025, 0.010 respectively

studied the spore germination of *Microsporum gypseum* in the presence of organic carbon and nitrogen. He has reported that the need of organic carbon was satisfied by glucose while nitrogen did not influence its growth. Kushwaha and Agrawal (1977) have studied the carbon metabolism in some soil inhabiting keratinophilic fungi. Results suggested that these fungi have exhibited carbon heterotrophy as was reported for other soil fungi and meet their carbon requirements in different sources of carbon.Choudhury (1994) studied the carbon assimilation pattern of 3 strains of *Gymnoascaceae.* Monosaccharides and polysaccharides were the best sources of carbon for *Trichophyton rubrum* and *Microsporum gypseum.* Senapati and Choudhary (1997) have studied the carbon assimilation pattern in three keratinophilic fungi (*Trichophyton rubrum, Microsporum gypseum* and *Chrysosporium indicum*). Glycerol was an excellent carbon source for growth followed by glucose and starch. In the present investigation the growth of *Microsporum gypseum* was studied on glucose containing Sabouraud's medium. Glucose was replaced by galactose, lactose, maltose and glycerol. Control was maintained without glucose. Glucose containing Sabouraud's liquid medium has yielded more fungal biomass followed by lactose, glycerol, galactose and maltose over control. The present data is a new information that is reported with reference to an non dermatophytic, soil isolate of *Microsporum gypseum* on its growth in relation to some carbon sources. All other carbon sources tested did not give any positive results. Therefore, only five carbon sources are selected.Nitrogen is an important element that affects the growth of many soil fungi and keratinophilic fungi. The present study has clearly revealed that Sabouraud's glucose liquid medium supported maximum growth of *Microsporum gypseum* over control (without peptone). Among the other nitrogen sources tested L-Glycine and L-Asparagine have registered limited growth. All other nitrogen sources though used did not support any growth. The results are in compliance with those observed by Kushwaha (1984) who reported that of all the

nitrogen sources, peptone was best source for the growth of keratinophilic fungi.

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